With the

Medical Officer of Health's

Compliments.

Town Hall,
Leicester

REPORT

ON THE

SMALLPOX EPIDEMIC

IN LEICESTER

IN

1904.

BY

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Town Hall, Leicester,

February, 1905.

The Chairman and Members of the Sanitary Committee.

Gentlemen,

I beg to report to you on the epidemic of Smallpox in Leicester in 1904.

My previous report to you on the subject of Smallpox dealt with the epidemic of 1903, which comprised 394 cases with 21 deaths. The epidemic now under consideration comprises 321 cases with four deaths.

The fatality of both epidemics was low, and especially that of the last, which, I believe, is almost unique, being only 1·2 per cent.

Further experience has confirmed and strengthened the conclusions arrived at after the first epidemic.

A few salient facts may be summarised here :—

(a) Throughout the whole course of both epidemics, during which the total number of cases occurring was 715, there was NOT ONE SINGLE INSTANCE OF THE DISEASE ATTACKING A PERSON WHO HAD BEEN RECENTLY VACCINATED BEFORE EXPOSURE TO INFECTION.

(b) There was not a single member of the Hospital staff who contracted the disease, although most of the staff were constantly and severely exposed to infection.

(c) No precautions were taken to secure this happy result except recent vaccination.

(d) The loss of life caused by the two epidemics was surprisingly small.

(e) The un-vaccinated section of the community again escaped much more lightly than it was feared would be the case.

(f) Comparatively little spread of infection took place through the medium of schools.

(g) On the other hand, great spread took place THROUGH THE MEDIUM OF VERY SLIGHT CASES WHICH HAD ESCAPED DETECTION, *and such cases usually occurred in vaccinated subjects.*

Some facts relating to the history of Smallpox and Vaccination in Leicester, as also the details of the method of dealing with Smallpox pursued in Leicester, were given in my report on the 1903 epidemic.

It is a curious coincidence that in the two years, 1903 and 1904, in which the epidemics occurred, the general death-rate of Leicester was the lowest on record.

It is sometimes alleged against medical men that their special training and education prejudices them in favour of vaccination. It is possible that there is some justification for this charge. I have striven, therefore, in writing this report, to put aside all preconceived opinions, and to make it as impartial as possible.

I wish to acknowledge here the great assistance I have received in dealing with the epidemic from Chief Inspector Braley (whose work in connection with Smallpox is invaluable) and the other members of the Sanitary staff; also from Dr. Allan Warner (Assistant Medical Officer of Health) and the various members of the Hospital staff. One and all have worked loyally and well.

I am, Gentlemen,

Your obedient Servant,

C. Killick Millard

Medical Officer of Health.

SMALLPOX IN OTHER TOWNS DURING 1904.

Since this Report was written, the Registrar General's Annual Summary has appeared showing the experience of other large towns in England and Wales during the year 1904.

The following table has been prepared showing the figures for those large towns in which, during 1904, Smallpox was epidemic to the extent of one case per 1000 inhabitants.

Town.	Estimated Population.	No. of Cases.	No. of Deaths.	Attack-Rate per 1000	Mortality per 1000.	Fatality (Case-Mortality) per cent.
Derby ...	120,000	209	3	1·74	·03	1·4
Gateshead ...	118,000	395	34	3·34	·29	8·6
Leicester	**224,000**	**307†**	**4***	**1·37**	**·02**	**1·3**
Newcastle ...	225,000	355	18	1·57	·08	5·1
Nottingham	249,000	291	12	1·17	·05	4·1
Oldham ...	139,000	248	14	1·78	·10	5·6
Stockport ...	97,000	155	14	1·60	·14	9·0

* The number of deaths is stated in the Registrar General's Summary as *five*, but the correct number is *four*. See pages 17 and 18 of Report.

† The figure given by Registrar General is 297, but this does not include several unrecognised cases only discovered after recovery.

PART I.

THE SMALLPOX EPIDEMIC OF 1904.

It will be recollected that the Smallpox epidemic of 1903, which was made the subject of a special report, lasted from December, 1902, until October, 1903. For several weeks prior to the latter date only an occasional case had occurred, and then finally there was a clear interval of five weeks during which no cases were reported. During this time the few cases remaining under treatment were discharged, and on December 5th the last patient went home and the hospital was closed. The town was then believed to be quite free from the disease.

Only four days later, however, on December 9th, three cases were reported simultaneously in connection with a common lodging-house, and this proved to be the beginning of a fresh epidemic. The infection spread, and it was also re-introduced several times from outside. (See Table C in the Appendix.)

By the end of December, 14 cases had occurred. During the first three months of 1904 the outbreak only slowly increased, but in April it suddenly assumed serious proportions, over 100 cases occurring during that month. Fortunately it quickly subsided during May and June, in July only some straggling cases occurred, and it was finally extinguished in August. From that time until the end of the year no further cases arose.

The present report, therefore, dealing with the epidemic of 1904, covers the period from December, 1903, to August, 1904, during which time 321 cases occurred.

The following table shows the progress of the epidemic month by month:—

PROGRESS OF THE EPIDEMIC.

Month.	No. of Cases.
December (1903)	14
January (1904)	13
February	26
March	61
April	107
May	52
June	33
July	10
August	5
Total	321

Probably the most note-worthy feature of the epidemic was the very mild type of the disease as evidenced by its remarkably low fatality, only four cases* proving fatal, which is equivalent to a fatality on the 321 cases of only 1·24 per cent. Such a record is, I believe, almost unique. Moreover, one of the four fatal cases was an imported one—the child of a tramp—which was not infected in Leicester and did not belong to Leicester, merely happening to sicken with the disease whilst passing through the town.

Such a small loss of life is of course very satisfactory, and is all the more remarkable as occurring in Leicester where such a large proportion of the population is unvaccinated. It should be noted, however, that throughout the country during the past year the prevailing type of the disease was much more favourable than usual. In any case, it would be a grave mistake to underestimate the seriousness of Smallpox, for we have no guarantee, unfortunately, that in future outbreaks the type of the disease will be equally favourable. Moreover, apart from the risk to life, Smallpox is always a disease to be dreaded. For one thing, on account of its intensely infectious nature, there is always the risk

* The Registrar General records five deaths. (See footnote on page 17.)

of its getting out of control, in which case the consequences to the trade of a town would be disastrous.

The very mildness of the disease, though so fortunate in one respect, undoubtedly added greatly to the difficulty of stamping it out, for many cases occurred, especially in persons who had once been vaccinated, of so slight and trivial a character that the persons affected were able to go about in an infectious condition without its being known from what they were suffering. It was only after they had infected others that the real nature of their illness was discovered. Such cases were responsible for a very wide extension of the disease. Thus, to five "unrecognised" cases of this class, occurring in the short space of four weeks, no less than 40 other cases were directly traced.

Another feature of the epidemic was the number of cases occurring in common lodging-houses. Such cases have always been recognised as being specially difficult to deal with. The usual measures of vaccination and surveillance of contacts, which we have found to be so efficacious in private dwelling houses, are inadequate in the case of common lodging houses, the inmates of which are, for the most part, of nomadic habits, irresponsible, and difficult to control.

DETAILS OF THE EPIDEMIC.

On December 9th, 1903, after an interval of five weeks, as already stated, during which no cases were reported, three cases were reported simultaneously at a house in Woodboy Street, next door to a common lodging-house and occupied by the keeper of the house, J.W. The persons attacked were Mrs. W. and two children, all unvaccinated. They had all been taken ill within a day or two of each other. Inquiry elicited the fact that about a fortnight previously J.W. himself had been ill, though no eruption had appeared, but, from the history given, there is no doubt that he had suffered from an unrecognised attack of the disease and had infected his wife and children. The man had been vaccinated in infancy 37 years before, but never since. Exactly how he contracted the disease was not discovered. It was impossible to connect his case with any of the known cases

which had occurred in October, but as keeper of a common lodging-house, and liable to come into contact with persons from all parts of the country, it is easy to understand how the infection could have been brought to him. Unfortunately, one of the two children who were attacked continued attending school for a day or two after being taken ill, though *before the eruption had appeared*,* and in this way she infected six other children attending the school. A third child in the house and a neighbour's child who had visited the house also contracted the disease.

THE BRITANNIA STREET OUTBREAK.

On December 22nd, whilst the Woodboy Street outbreak was still going on, a tramp, John T., staying at a lodging-house in Britannia Street, was found to be suffering from the disease. He had only just arrived in Leicester, and, from the history he gave, it is probable that he got infected in Nottingham where he had stayed for some days a fortnight previously.

Twelve days after this case was discovered, an inmate (Isaac S.) of a neighbouring lodging-house began to sicken with the disease, and though actual contact could not be proved, it is probable that he was in some way infected by John T. This case proved to be the beginning of a serious outbreak. The lodging-house was a large one, having at the time an average of about 100 male lodgers. Altogether, seventeen of these contracted the disease at intervals, as also a woman who had visited the house, before the infection was finally stamped out.

In January, 1904, whilst this outbreak was going on, the disease was again imported into the town, this time from Loughborough. A knife-grinder and his wife who, with two children, were tramping about the country arrived in Leicester and took a furnished room in connection with another lodging-house in Britannia Street. Shortly afterwards both the man and woman sickened with Smallpox and were removed to hospital. The

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* In our experience, it is rare for infection to be conveyed before the appearance of the eruption. We have had repeated instances of children attending school during the pre-eruptive stage without spread of the disease.

woman had an abortive attack without eruption: the husband's attack was more severe.* It appeared that about a fortnight before they had been staying at a lodging-house in Loughborough where cases of Smallpox had recently occurred.

About the same time the disease broke out in Curzon Street. Here also the infection was presumably imported. The patient, a young man, had been staying in Nottingham just a fortnight previously, having walked there from Leicester in search of work. He gave the disease to his wife, who, though strongly advised, refused to be vaccinated.

Early in February the disease appeared at Aylestone, but the source of infection could not be traced. The outbreak resulted in six cases in three houses, and then died out.

About the same time two cases occurred in a lodging-house in Lee Street, and a third case was probably from the same source. Fortunately this outbreak went no further.

A little later in the month, February 27th, the disease was again imported from Loughborough by a female tramp who infected two other women living in Orchard Street, and simultaneously an Arab living in a lodging-house in Orchard Street was attacked, probably infected from the same source.

On February 12th, information was telephoned from Loughborough that the infant child of a woman who had been admitted to the Loughborough Smallpox Hospital had been brought by the grand-mother—a gipsy—to Leicester. The child was found with the grand-parents in a gipsy van on a vacant piece of land off Catherine Street. The Smallpox eruption was just appearing.† Two days later a man, living in Queen Mary Street, who had also

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* The man and his wife had both been vaccinated in infancy and also the elder child. The younger child was un-vaccinated. Both the children escaped. There is no evidence, however, that they were exposed to infection at the time the parents got infected, and after the parents developed the disease they were both vaccinated.

† The other occupants of the van, a gipsy man, his two "wives" and a son, were at once vaccinated. They were moved with the van to the Anstey Lane near the Hospital where they were kept under observation. No further case occurred.

been infected in Loughborough from the same source, was found to be suffering from the disease.

From this time onward the disease became generalised and many cases occurred which could not be traced. The epidemic reached its maximum in April (as was also the case in 1903) and then declined as rapidly as it had increased. The highest number of cases occurring in any one week was 39 in the week ending April 5th. In the 1903 epidemic the weekly numbers twice rose above 50. The progress of the epidemic week by week is seen graphically in the accompanying chart. For comparison the corresponding curve for the 1903 epidemic is also given.

It will be noticed that there is a general similarity in the curves, and especially as regards the very remarkable exacerbation in April. It will be recollected that it was found impossible to satisfactorily account for this exacerbation in 1903, as practically none of the cases could be traced. In 1904, on the other hand, a majority of the cases could be traced to some previous case, and many of them were caused by "unrecognised" cases—very slight, apparently trivial cases (usually in vaccinated subjects)—which only came to light after they had spread the disease to others.

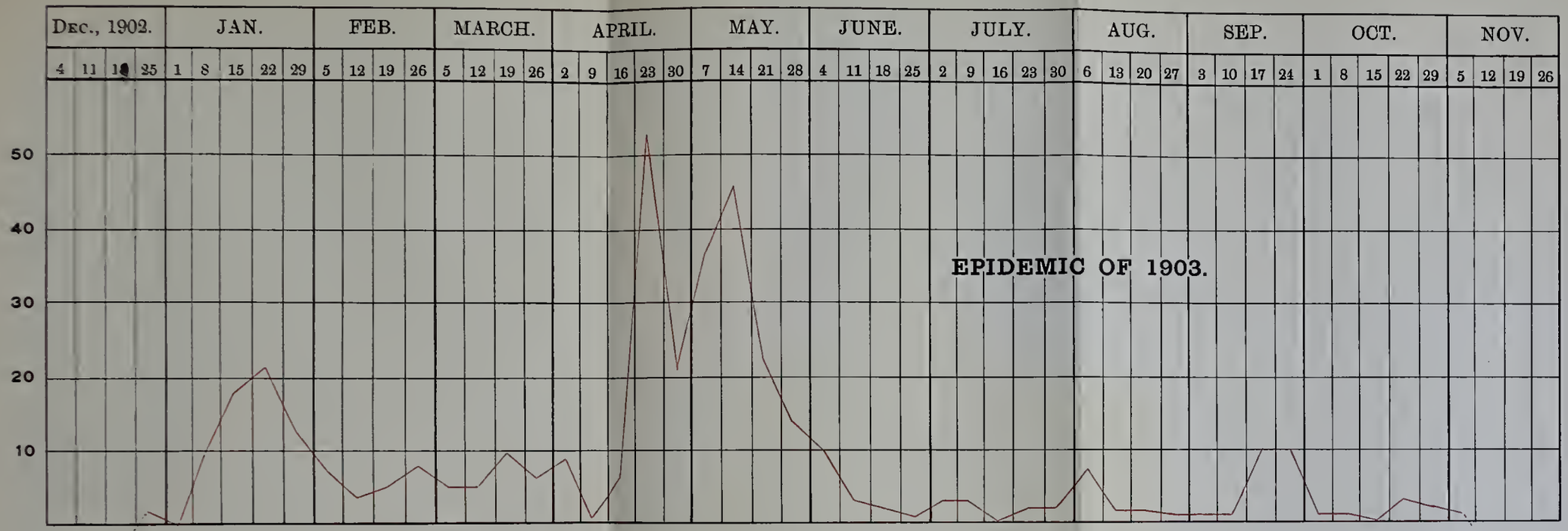
Brief particulars of each case that occurred during the epidemic will be found in Table F in the Appendix.

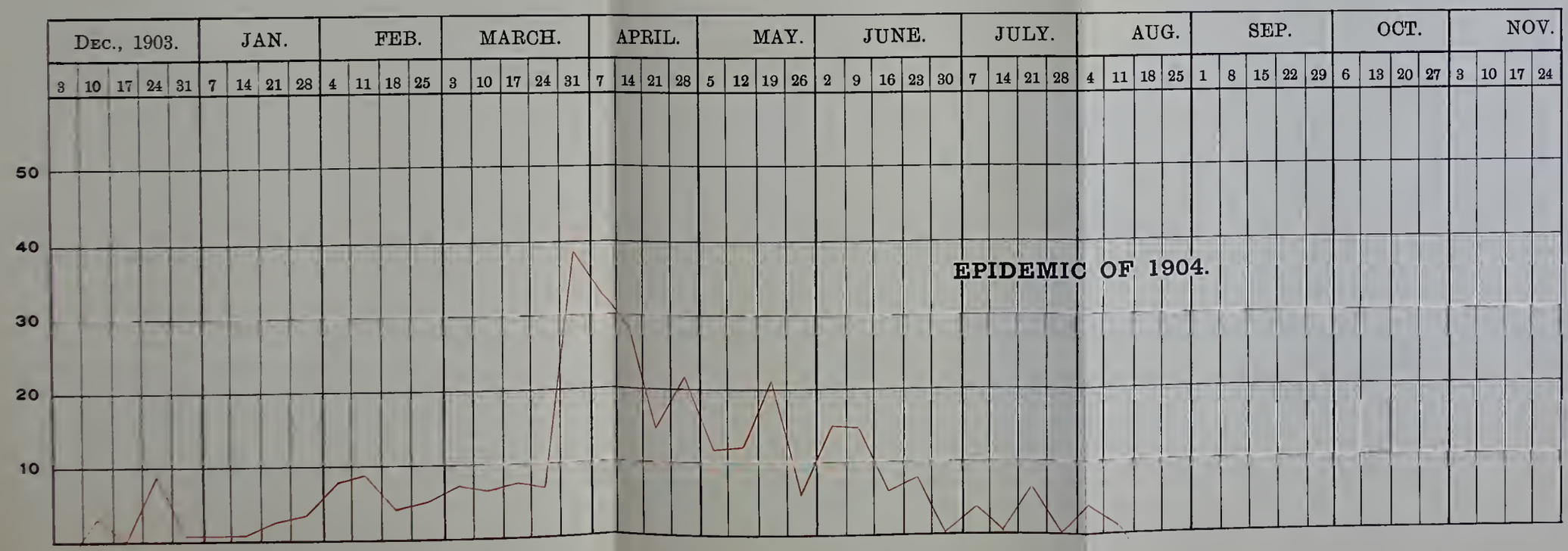
SCHOOL INFECTION.

In view of the fact that over 80 per cent. (probably nearly 90 per cent.) of the children attending the public elementary schools in Leicester have never been vaccinated, and that school attendance, as is well known, provides very favourable conditions for the spread of infection, it was certainly to have been expected that considerable spread of the disease would have occurred amongst children infected at school. Fortunately, however, such was not the case, for although during the course of the epidemic there were 58* school children attacked, yet only in 17 instances

* This is exclusive of school children who were known contacts, for in such cases they were of course excluded from school attendance.

CHARTS showing number of cases of Smallpox occurring each week.





was there any reason to think that the infection had been received at school.

It will be recollected that in the 1903 epidemic there was also surprisingly little infection through the medium of schools. Thirty-six children were attending school at the time they were attacked yet only in nine instances was the source of infection traced to the school (page 48, 1903 Report). The experience of the 1892-3 epidemic appears to have been similar.

It will be understood, of course, from the above that the majority of the school children attacked were infected at home or elsewhere, but not at school.

The explanation I have to give of this fortunate escape—so different from what was expected—is as follows:—Smallpox is not infectious, speaking generally, during the incubation period. The onset is *sudden*, not insidious, so that as soon as an unvaccinated child sickens it at once becomes *too ill to attend school*. The case would be very different if a vaccinated child contracted the disease. In such cases the attack is almost always so slight and trifling in character that it might easily happen that it would escape detection and the child continue to attend school. In Leicester, however, the proportion of vaccinated children is so small that such a contingency has not yet happened. Should it ever occur the consequences would probably be disastrous. During the recent epidemic the disease was of so favourable a type that some of the unvaccinated cases assumed the highly modified and trivial character so often seen in vaccinated cases, and the possibility of such a case being overlooked and allowed to attend school caused me great anxiety.

THE SMALLPOX HOSPITAL.

The Leicester Borough Smallpox Hospital is situated in an isolated position on the Anstey Lane, one mile distant from the outskirts of the town and a quarter of a mile from the Groby Road Fever Hospital. The buildings are of wood and iron and provide accommodation for 60 patients. At the time of the outbreak the administrative portion of the hospital was incomplete, but this has since been remedied, new kitchen, laundry,

and additional nurses' rooms having been added. In April, the number of cases under treatment went up to over 100, and this necessitated the use of the Groby Road Hospital for Smallpox. In anticipation of this necessity, fresh admissions of fever and diphtheria cases had been discontinued for some weeks previously, so that when the hospital came to be needed for Smallpox it was practically empty.* The Hospital remained closed to other diseases for three months. During this time I am pleased to be able to state that no increase occurred in the prevalence of the diseases usually treated there. This coincides with the experience of 1903, and I am satisfied, therefore, that the course adopted, viz., the utilization of the Groby Road Hospital for Smallpox, was wiser than attempting to deal with all the cases in the Anstey Lane Hospital, which would only have been possible by hastily putting up a number of emergency buildings which might never have been required again for many years. Moreover, the experience of most towns which have attempted to run up emergency buildings in the presence of a rapidly increasing epidemic has rarely been satisfactory and has sometimes failed altogether, as was notably the case at Gloucester, the epidemic increasing faster than the buildings could be put up. In the Groby Road Hospital, on the other hand, we had a fully equipped hospital already erected, with ample administrative accommodation, so that if the epidemic had spread and we had had to deal with even four times as many patients at one time as was actually the case no great difficulty would have been experienced.

One of the most fruitful causes of failure to control epidemics in towns where general vaccination of the population has fallen into disrepute, has been the absence of adequate hospital accommodation.

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* It will be recollected that in the previous year, 1903, when the Groby Road Hospital was required for Smallpox, a large number of fever and diphtheria patients had to be sent home at short notice,

THE SMALLPOX HOSPITAL STAFF.

The majority of the staff employed at the Smallpox Hospital in 1904 were the same as had acted during the 1903 epidemic. The total number of resident staff employed during the two epidemics was 74.

Everyone (with the exception of three who had already had Smallpox before being employed) *had been recently vaccinated.*

All the staff were more or less exposed to infection, but especially the nurses, 39 in number. As I stated in my previous report, they may be described as having been "literally steeped "in infection. They had to wash and feed the patients: to make "their beds and change their soiled linen; to dress their sores "and cleanse their mouths (often most offensive in bad cases): "to collect and burn the scabs (often in handfuls) that are shed "by the patients: and in the event of a fatal issue, to 'lay out' "the corpse. Many of them continued on Smallpox duty for "many weeks at a stretch without a break. Although the health "of the staff on the whole was good, there were times, as might "be expected from the arduous nature of their duties and the "close confinement, when they would feel 'run down' and be "specially liable, one would think, to contract any infection. At "the outset there was no question of their being 'seasoned' to "the disease because most of them (prior to 1903) had never "seen a case of Smallpox before." Yet although, during the two years, nearly 700 cases of Smallpox, of all degrees of severity, passed through the hospital, *not a single member of the staff contracted this most infectious disease.*

How is this remarkable immunity in the presence of such severe and continuous infection to be explained?

The explanation is that *recent vaccination confers specific protection against Smallpox.*

It has been suggested that this truly wonderful immunity was secured, not by vaccination, but by other means which were taken. I can only reply that as medical superintendent of the hospital and responsible for its management, I ought to know

what precautionary measures were taken, and I say emphatically that *beyond vaccination no steps whatever* were taken to protect the staff. I knew that with efficient and recent vaccination no other measures were necessary, and that without it none would be of avail. It has been said that free ventilation of the wards and the use of disinfectants constitute a sufficient safeguard against Smallpox. Only those with no practical experience of the disease could think thus. In any case, I can say that in the Leicester hospital the use of disinfectants is practically confined to the time when the patients or nurses quit the hospital, whilst as regards ventilation, although this is undoubtedly very important for the sake of the patients and on general hygienic grounds, it would indeed be a broken reed to trust to in the case of nurses carrying out the duties detailed above.

I may mention here that two workmen temporarily employed upon some alterations at the Smallpox hospital, but who never entered the buildings occupied by patients, contracted the disease. Neither of them had been vaccinated since infancy.

As a contrast also to the immunity enjoyed by the staff during the recent epidemic, we have the experience of the 1892-3 epidemic. At that period six of the staff declined to submit to vaccination (not having been vaccinated since infancy) with the result that five of the six contracted the disease and one of them died.

THE TYPE OF THE DISEASE.

I have already referred to the mild and favourable type of the epidemic. As a result of this many of the cases which occurred were of a very slight and trivial description, the illness being of brief duration and the eruption scanty and quickly dying away. Some of the cases, indeed, were so very slight—the eruption being confined to a few "pimples" or absent altogether—that they were mistaken for cases of influenza. Such cases have been described as "varioloid," though the name is not a good one as it is liable to convey the impression that they are not true Smallpox, which they undoubtedly are as is proved unmistakably by the spread of infection to others.

These cases of "abortive" Smallpox are much more common in persons who have been vaccinated (many years before) than in the unvaccinated, though it is certainly the case that they may *sometimes* occur (in very benign epidemics such as we are now considering) in persons who have never been vaccinated. An interesting paper describing a number of these cases and illustrated by photographs has been published* by Dr. Allan Warner, Assistant Medical Officer of Health for Leicester. It should be clearly understood, however, that these cases occurring in unvaccinated subjects were quite exceptional. The great majority of the unvaccinated cases were definite, easily recognised attacks.

I am referring later to the mischief that is apt to be caused by very slight cases if their real nature should not be recognised.

In the case of several of the vaccinated patients the symptoms of the disease when first admitted to hospital were so slight or so atypical that it was thought desirable as a precautionary measure to apply the vaccine test. In the absence of complete isolation wards this is the only safe course to adopt if these cases are to be removed to hospital, which it is very important in the public interest that they should be. In all cases the consent of the patients or their friends was first obtained.

DETAILS OF THE FATAL CASES.

The particulars of the four† cases which proved fatal are as follows:—

No. 44. William B., aged 46, a man of broken-down constitution whose wife had left him on account of his drunken habits.

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* *The Practitioner*, October, 1904.

† The Registrar General records *five* deaths. The particulars of the supposed fifth case are as follows:—Grace K, an un-vaccinated baby *only 16 days old*, was admitted to Hospital on April 22nd, 1904, suffering from Smallpox. The attack was not a severe one, and in spite of the child's tender age she made an excellent recovery. Special care was taken as regards the feeding of the infant with the result that she throve remarkably whilst in hospital. I am told that she was never sick once. On May 21st

He had a severe confluent attack. He stated positively that he had been vaccinated in infancy. There were no vaccination marks on his left arm, but on the right arm lower down than usual were two very indistinct marks which may or may not have been vaccination scars. Although classed as vaccinated the evidence that the man ever had been vaccinated can scarcely be regarded as conclusive. His parents being dead no confirmation of his statement could be obtained from them.

No. 133. Sarah T., aged 8, unvaccinated. The attack was a malignant one and proved fatal in six days.

No. 209. John H., aged 5 weeks. Unvaccinated. Had a coherent attack.

No. 220. Mary C., aged 5, unvaccinated. Had a confluent attack. This case did not belong to Leicester and was not infected in Leicester. Her parents were tramping from Manchester to London and the child was taken ill only a few days

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she was discharged and was handed over to her mother "looking the picture of health." Unfortunately for the child, she left an institution where she was receiving special care and attention for a poverty-stricken home where there were *eight more children*, only three of them being over twelve years of age. Such a change of environment was more than the poor infant could endure. Within a few days of returning home she began to waste rapidly away, and within a fortnight she was dead!

The medical man who was called in certified the death, without comment, as due to "variola." The symptoms, however, which were of a negative character, suggested marasmus, and the medical man, having his attention drawn to the facts of the case, sent in an amended certificate of "marasmus following variola."

I wrote to the Registrar General, laying the facts fully before him, and stating emphatically that I did not think it would be at all correct to ascribe the death to Smallpox.

I received a formal acknowledgment thanking me for the information sent and saying that the facts should be noted. In spite of this, however, the death was classified as due to Smallpox!

Personally, I am quite satisfied that the death cannot fairly be ascribed to Smallpox, but was undoubtedly due to the unfavourable surroundings and method of feeding at home. I think it is most probable that in such surroundings the child would never have lived in any case.

If a vaccinated child had died from marasmus under similar conditions, after it had been discharged from hospital cured, I think most medical men would agree that it would be unfair to ascribe the death to Smallpox. Therefore I cannot regard it as fair that this death should be so ascribed.

after reaching Leicester. She was apparently infected somewhere in the neighbourhood of Burton-on-Trent, where they were staying a fortnight previously.

THE COST OF THE EPIDEMIC.

The chief item in the cost of the epidemic to the town was the expense of treating the patients in hospital. It is impossible to state this exactly as separate accounts are not kept for each disease treated at the hospital. I believe, however, that if an allowance of £1 per week per patient be made, it would be a fair estimate, and on this basis the cost of treating the 306 patients who were removed to hospital (the mean stay in hospital being 29·6 days) works out at £1294.

The next item in importance was the amount paid in compensation to contacts for staying away from work, viz., £177.

There was also £60 given in gratuities to the Sanitary Staff for extra work entailed by the epidemic; and the cost of disinfecting, cab hire, and sundries, may be put down at another £100.

We ought also to include the cost of vaccinating contacts, say £130, for nearly the whole of this had to be paid for out of the rates, though not through the Corporation.

This brings up the total money cost of the epidemic to £1761.

The loss of life caused by the epidemic was astonishingly small. There were only four deaths, one a man of broken-down constitution and drunken habits, and three children: one of the latter was a baby five weeks old, and one was the child of a tramp. The last case as stated above did not belong to Leicester, and was not infected in Leicester, so that this death might fairly be deducted.

There was also, I am pleased to say, very little permanent disfigurement or injury produced by the disease in those who recovered, the great majority showing no scarring whatever.

On the whole, therefore, Leicester is certainly to be congratulated on having once again escaped so lightly. Whether she will always be so fortunate time alone will reveal. To prophesy good is as great a mistake as to prophesy evil!

PART II.

STATISTICS OF THE 1904 EPIDEMIC.

CLASSIFICATION OF THE CASES AND DEATHS, AS REGARDS VACCINATION.

The following table shows the proportion of vaccinated and unvaccinated cases, and the relative fatality :—

	Cases.	Deaths.	Fatality per cent.
Vaccinated ...	127	1*	
Unvaccinated ...	192	3	
Uncertain ...	2	...	
Total ...	321	4	1·24

Twenty-one of the unvaccinated and four of the vaccinated cases were vaccinated during the incubation period (see Table B).

One of the vaccinated cases and one of the unvaccinated cases had previously suffered from Smallpox (cases 41 and 191). Four of the vaccinated cases had been re-vaccinated.

As regards the two cases classed as uncertain, one, No. 32, was a severe case in an Arab. No vaccination marks could be discovered, and neither the patient nor his friends had any idea whether he had been vaccinated or not. The other case, No. 154, was a very mild case in a girl of 18, whose mother was dead. No vaccination marks could be discovered. The father "thought" she had been vaccinated, but could not be sure.

In one of the vaccinated cases there was doubt if the case really was Smallpox.

The following are the corresponding statistics of the 1903 epidemic :—

	Cases.	Deaths.	Fatality per cent.
Vaccinated ...	194	4	2.06
Unvaccinated ...	198	16	8.08
Uncertain ...	2	1	...
Total ...	394	21	5·33

* See remarks about vaccination of this case on page 18.

In case it should be desired to treat the epidemics of 1903 and 1904 as all one outbreak, the following table shows the figures for the two epidemics combined:—

Smallpox in Leicester (December 1902 to August 1904).

	Cases.	Deaths.	Fatality per cent.
Vaccinated ...	321	5	1·55
Unvaccinated ...	390	19	4·87
Uncertain ...	4	1	...
Total ...	715	25	3·49

THE VACCINATION OF CONTACTS.

This is an aspect of the vaccination question to which close attention has been paid in both epidemics. No pains were spared to persuade as many as possible of the inmates of the invaded houses to submit to vaccination. Our experience proves that when the first case in a house is recognised *early*, and the other inmates at once submit to vaccination, there is very small risk of any of them developing the disease, even though they may never have been vaccinated previously. This aspect of the subject was dealt with very fully in my previous report.

The total number of invaded houses during the epidemic (exclusive of the Workhouse and lodging-houses) was 174.

The number of inmates of these houses (exclusive of the persons first attacked) was 823.

Of these, 111 persons, or 13·4 per cent., were subsequently attacked.

It is very necessary, however, to distinguish between the houses in which the first case was recognised, and therefore removed to hospital and other precautions taken, and those in which the first case was un-recognised.*

* As before, I have reckoned as un-recognised those cases in which the nature of the attack was not recognised until the eruption had been out for at least a week.

TABLE I.

	No. of Houses.	No. of other Inmates.	No. who contracted Smallpox.	Attack Rate per cent.
(1) First case recognised ...	162	746	62	8·3
(2) First case unrecognised	12	77	49	63·6
Total ...	174	823	111	13·4

The above table shows the terrible consequences which follow when the first case of Smallpox in a house is not recognised.

In the case of the houses in which the first case was recognised, a very small proportion of the other inmates contracted the disease. This was due to two causes. In the first place immediately a case was recognised as Smallpox it was removed to hospital and the source of infection thereby removed. Secondly, the great majority of the other inmates submitted to vaccination. The effect of this is shown below.

TABLE II.

(CORRESPONDS TO TABLE III., PAGE 58, IN 1903 REPORT.)

Houses where first case was recognised and removed to Hospital.

	No. of Persons.	No. who contracted Smallpox.	Attack Rate per cent.
(1) Inmates who got vaccinated after occurrence of first case of Smallpox	533	26	4·8
(2) Inmates who did not get vaccinated after occurrence of first case ...	174	36	20·6
Total ...	707*	62	

From this it is seen that those inmates who did not submit to vaccination after the occurrence of the first case in a house were attacked *four times as heavily* as those who did submit. This is quite irrespective of their previous vaccinal condition.

* This is exclusive of 39 inmates, 24 of whom had already had Smallpox, 11 had been recently vaccinated, and in four cases precise information was wanting.

It is noteworthy, however, that even those who did not get vaccinated suffered very much less than the inmates of the houses where the first case was unrecognised and therefore not isolated. See Table I. (2).

Of these latter, no less than 63·6 per cent. were attacked.

It is interesting to consider the vaccinal condition of these persons prior to exposure to infection. This is shown below.

TABLE III.

Vaccinal condition of other inmates of houses in which the first cases of Smallpox was not recognised.

	No. of Inmates.	No. who contracted Smallpox.	Attack Rate per cent.
Vaccinated ... ... (mostly in infancy.)	31	13	41·9
Unvaccinated ...	45	36	80·0
Already had Smallpox	1	...	...
Total ...	77	49	63·6

The above table corresponds to Table VI. (3) in the 1903 Report, page 64. The corresponding attack-rates then were 50·0 per cent., and 79·4 per cent. In both epidemics the unvaccinated were attacked in far greater proportion than the vaccinated, though even the latter suffered very heavily.

THE AMOUNT OF VACCINATION PERFORMED IN LEICESTER DURING THE EPIDEMIC.

Although the actual number of Smallpox cases occurring in 1904 was not very far short of the number occurring in the previous year (viz., 321 against 394) there was a marked falling off in the amount of vaccination performed. This is shown by the following figures:—

Year.	Primary Vaccinations Registered.	Revaccinations performed by Public Vaccinators.	Total.
1903	2487	1456	3943
1904	1282	263	1545

In neither case are re-vaccinations performed by private practitioners included, the number being unknown. From what I could learn, however, the amount was very small except amongst the better classes.

The explanation of this decline is that in 1904 the public had become accustomed to the presence of the disease in the town, and very little alarm was felt. The exceptionally mild type of the disease probably also contributed to this.

The number of primary vaccinations registered in the different quarters of the year was as follows:—

Primary Vaccinations Registered.

	First Quarter.	Second Quarter.	Third Quarter.	Fourth Quarter.
1903	491	1427	292	277
1904	298	546	253	185

The following table shows the number of vaccinations in the past ten years:—

Year.	Primary Vaccinations Registered.	Year.	Primary Vaccinations Registered.
1894	133	1900	343
1895	75	1901	357
1896	86	1902	1237
1897	81	1903	2487
1898	92	1904	1282
1899	156		

RE-VACCINATION.

Only four of the cases stated that they had been re-vaccinated: this is exclusive, of course, of vaccinated persons vaccinated again during the incubation period. The interval between the re-vaccination and the attack of Smallpox was (as nearly as could be ascertained) as follows:—48 years, 33 years, 36 years, and 30 years; and the character of the attacks was in two cases discrete, and in two mild discrete.

During the 1903 epidemic, the number of re-vaccinated cases was eleven, giving a total of fifteen re-vaccinated cases for the two epidemics out of 715 cases of Smallpox.

A reliable clue to the proportion of re-vaccinated persons in the population of Leicester in those districts invaded by Smallpox is obtained from the proportion of re-vaccinated persons found to exist amongst the other inmates of invaded houses. The vaccinal condition of the other inmates was in all cases recorded with special care. Taking the two epidemics together, I find that amongst 1907 inmates of invaded houses (excluding the persons first attacked) 93 had been re-vaccinated at some time or other in their lives prior to the outbreak of the disease. This is equivalent to 4·9 per cent. Yet out of the 715 cases of Smallpox which occurred only 15 had been re-vaccinated, or 2·1 per cent. That is to say, 4·9 per cent. of the inmates of invaded houses had been re-vaccinated (at some time in their lives), but only 2·1 per cent. had been re-vaccinated of the persons attacked.

VACCINAL CONDITION OF THE POPULATION OF LEICESTER.

In my previous report, I referred to an investigation I had had made as to the vaccinal condition of the population living in those districts of the town where Smallpox had prevailed. From this I found that of 4946 persons living in 1056 houses in 22 streets, prior to the epidemic, nearly 62 per cent. had been vaccinated, 35 per cent. were unvaccinated, and nearly 3 per cent. had had Smallpox.

Vaccinal condition of Population.

Houses visited 1056.	No. of Inmates.	Proportion of whole.
Vaccinated persons ...	3053	61·7
Unvaccinated persons ...	1748	35·3
Had Smallpox	145	2·9
	4946	100·0

Perhaps, however, the most reliable clue to the true vaccinal condition of the inhabitants of the invaded districts is the vaccinal condition of the other inmates of the invaded houses.

Vaccinal Condition of Inmates of Invaded Houses. 1904 Epidemic.

In 174 private houses invaded by Smallpox there were living 823 inmates, exclusive of the persons first attacked.

Their vaccinal condition prior to the outbreak was as follows :

	No. of Inmates.	Proportion of whole.
Vaccinated*	353	42·9
Unvaccinated	431	52·3
Had Smallpox	27	3·3
Uncertain	12	1·4
	823	100·0

* Of these, 28 had been re-vaccinated.

The corresponding figures for the 1903 Epidemic were as follows :—

1903 Epidemic.

Number of Invaded Houses, 233 (exclusive of 18 houses where the first case was not recognised).

	No. of Inmates.	Proportion of whole.
Vaccinated†	525	48·4
Unvaccinated	495	45·6
Had Smallpox	51	4·7
Uncertain	13	1·2
	1084	100·0

† Of these, 65 had been re-vaccinated.

Both Epidemics Combined.—1903 and 1904.

	No. of Inmates.	Proportion of whole.
Vaccinated persons ...	785	41·5
Re-vaccinated	93	4·9
Unvaccinated	926	48·5
Had Smallpox	78	4·0
Uncertain	25	1·3
	1907	100·0

It is interesting to compare with the above table the vaccinal condition of the persons actually attacked by Smallpox, and who were living in the same houses.

Vaccinal Condition of Persons Attacked.—Epidemics of 1903 and 1904, combined.

	No. of Cases.	Proportion of whole.
Vaccinated Persons ...	304	42·5
Re-vaccinated	15	2·1
Unvaccinated	389	54·4
Previous Smallpox ...	3	·4
Uncertain	4	·5
	715	100·0

By a comparison between these two tables we obtain an insight into the relative incidence of the disease upon the vaccinated, the re-vaccinated, and the unvaccinated respectively. It is important, however, to remember that in Leicester where vaccination has fallen so largely into disfavour, "vaccinated persons" means, with few exceptions, adults vaccinated in infancy. So also as regards the re-vaccinated class. The great majority of these were persons re-vaccinated very many years ago. Many of them were ex-soldiers, who had been re-vaccinated on entering the army. There are very few recently vaccinated persons in Leicester.

PART III.

GENERAL.

THE VACCINATION CONTROVERSY.

It is permissible in a report such as this, after recording facts, to express an opinion upon debatable questions arising out of those facts.

Moreover, I feel that I have now some right to express an opinion on questions concerning Smallpox and Vaccination, for in addition to my experience of Smallpox in Birmingham in 1892-3, I have had, as your Medical Officer of Health, intimate experience of upwards of 700 cases of Smallpox in Leicester. Each of these cases has been closely investigated on the spot; the source of infection and vaccinal condition have been inquired into; the progress and development of the cases after removal to hospital have been studied day by day: and the subsequent history of all contacts has been carefully watched.

For the whole time, indeed, that the disease has been epidemic in the Borough the subject of Smallpox and Vaccination has engrossed my time and attention.

In the first place, then, I believe that the real crux of the vaccination controversy will be, in the future, the question of compulsion. Yet hitherto the battle has chiefly raged round the question of efficacy. Both sides seem to have regarded the latter question as the only key to the position, and almost every debate on vaccination quickly resolves itself into a furious attack and defence of this one salient point.

I wish to say frankly that my whole experience (and I suppose experience counts for something) convinces me that the anti-vaccinists in trying to disprove that vaccination confers specific protection against Smallpox are leading an utterly forlorn hope. This particular position of the vaccinists is, I am certain, quite impregnable.

But I do not think that it necessarily follows from this that the battle is quite over. There is an alternate line of attack open to the opponents of vaccination, viz., to contend that under modern conditions, in a civilised community, compulsory vaccination is not absolutely necessary for the control of Smallpox and the safety of the community (such supposed necessity being the ground on which the plea for compulsion was originally based).

As the Medical Officer of Health for Northampton (Dr. Beatty) has recently pointed out,* this contention may be wrong, but it is at least a defensible position, and I agree with him that this is the line of argument on which those who cannot reconcile themselves to compulsory vaccination would be wise to rely. I am quite sure that it is, to say the least of it, a bad error of tactics to attempt to overthrow compulsory vaccination on the ground that vaccination does not, and cannot, protect against Smallpox. Those who attempt to do so are only wasting their strength, and are beating their heads against a rock—the rock of hard fact.

The cause of anti-vaccination will never make any real progress until the untenable position of denying the protective power of vaccination is finally abandoned. I do not say that it will make very much progress even then, but any progress it may appear to make at present cannot be true progress for it is based upon a fundamental error.

Few will deny that exaggerated claims on behalf of vaccination were made in the past. Perhaps not all of these have even yet been abandoned. Such exaggerated claims have undoubtedly been largely responsible for calling the anti-vaccination movement into existence, and this movement has certainly helped to lead to their exposure.

It does not follow, however, that vaccination is therefore a "myth," or a "monstrous delusion," or an "obsolete fad," as many anti-vaccinists appear to believe.

It has often happened that in controversial questions the truth has ultimately been found to lie between the two extremes. It may well be that we shall eventually recognise that the whole

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* Annual Report. Northampton, 1903.

truth about vaccination does not rest with either the vaccinists or the anti-vaccinists. Yet, strange to say, there are comparatively few at present who seem to realize that any intermediate position on the vaccination question is possible.

If I were called upon to express my own views on the question in a brief sentence I would say that whilst I am quite satisfied that a *complete* system of repeated vaccination and re-vaccination strictly enforced would certainly eradicate Smallpox, I am not at all satisfied that such a system is really necessary or even practicable. As for the present incomplete system of single vaccination, its total effect is so uncertain that to attempt to enforce it strictly is both unnecessary and unwise.

SMALLPOX AND SCARLET FEVER MORTALITY IN LEICESTER.—A COMPARISON.

The annexed diagram represents the annual mortality from Smallpox and Scarlet Fever in Leicester during the past 66 years.

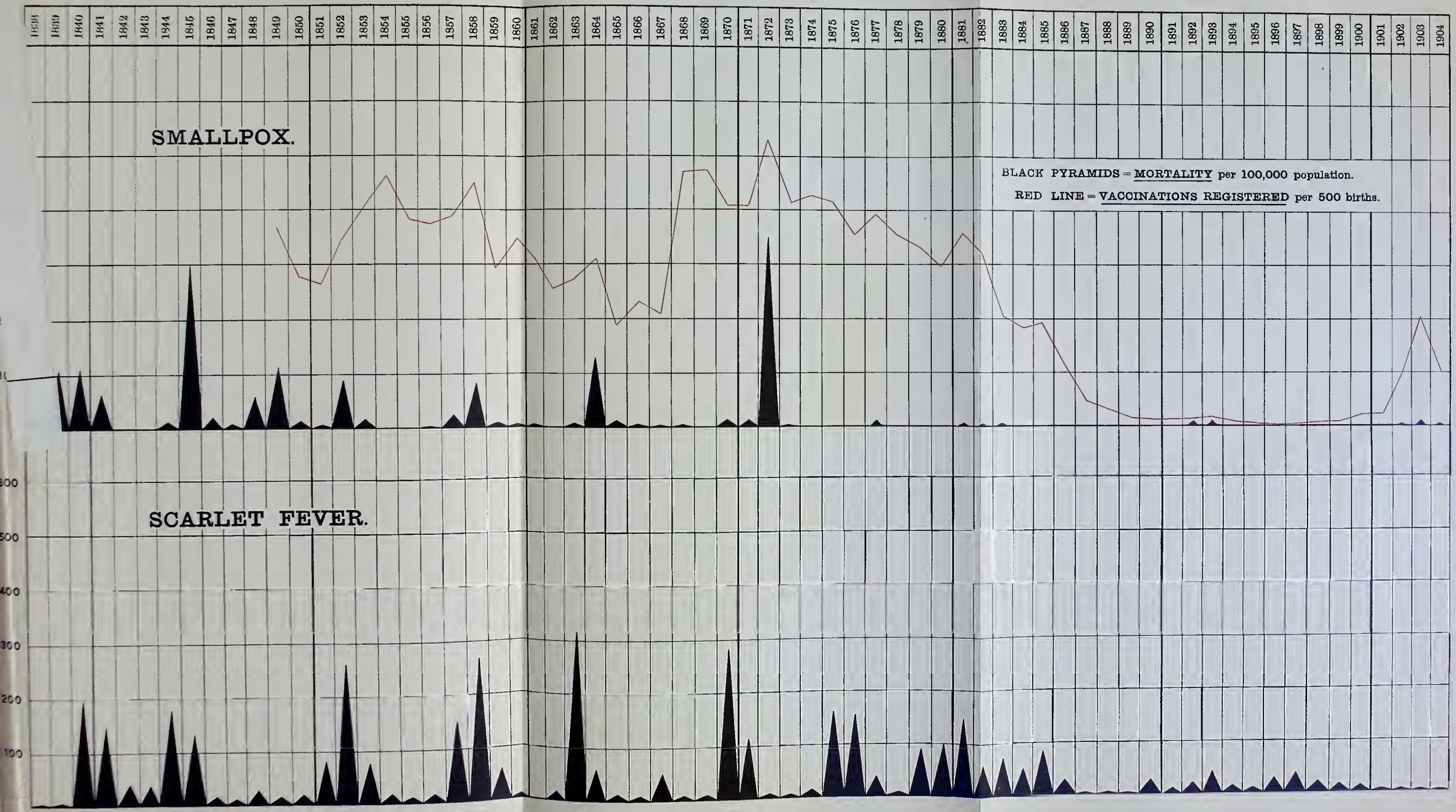
A comparison between these two diseases is instructive. Both diseases belong to the group of Acute Zymotics. Both diseases resemble each other in the manner of spreading, the principal mode of infection (it is believed) being direct from person to person. In both, the mortality was formerly very excessive, these two diseases being the most dreaded, probably, of all the exanthematous group. In both, the mortality has dropped during the past 30 years, until at the present day it is almost a negligible quantity as regards its effect upon the general mortality.

The idea naturally presents itself that this striking decrease in mortality in two diseases in the same group, coinciding so closely in point of time, may be due, in part at least, to some common, or at least similar, cause.

In the case of Scarlet Fever we are unable to state precisely what the cause is that has led to so notable a decrease in mortality, but clearly we cannot ascribe it to vaccination.

It is conceivable, then, that the theory usually put forward to account for the decrease in Smallpox mortality, viz., that it is the result of the extension of vaccination, though certainly attractive, may have to be qualified. A part of the reduction

DIAGRAM showing Smallpox and Scarlet Fever Mortality in Leicester, 1838-1904.



The figures from which this Diagram is drawn are, for the years prior to 1890, taken from the Tables in Append. 3, Fourth Rep. R.C.V., prepared and handed in by Mr. J. T. Biggs.

may be due to vaccination, as I personally believe it must have been, but considerable allowance may also have to be made for other influences. It would be reasonable, indeed, to assume that even if vaccination had never been discovered, a very considerable reduction in Smallpox mortality might nevertheless have taken place, just as we see has happened in the case of Scarlet Fever.

If it be admitted, however, that other influences besides vaccination have been at work to account for the reduction in Smallpox mortality, then we must obviously be careful as to how much of this reduction we claim as the effect of vaccination. It must, indeed, materially affect our estimate of the total service of vaccination to the present generation.

The diagram also indicates the number of primary vaccinations registered (in proportion to births) each year in Leicester and it is at once obvious that concurrently with the decrease in the mortality from Smallpox there has been a very notable diminution in the amount of vaccination. This is an additional and very potent argument against the contention that the decrease in Smallpox mortality is entirely due to the effect of vaccination.

This latter aspect of the question was discussed in my Smallpox Report for 1903, page 8.

THE SPREAD OF SMALLPOX BY "OVERLOOKED" OR "UNRECOGNISED" CASES.

There is one aspect of the vaccination question which I think merits closer attention and consideration than it has hitherto received.

It is now becoming generally recognised that one of the greatest difficulties in the way of preventing the spread of infectious disease is the occurrence of very slight cases which escape detection and in which, therefore, no precautions can be taken.

In the case of Scarlet Fever the occurrence of these slight unrecognised cases has frequently been put forward as largely explaining the failure of hospital isolation to control this disease.

The same is true as regards Diphtheria. Thus, the Medical Officer of Health for Bristol, in his Annual Report for 1903, page 41, writes:—"Diphtheria is now known to be a disease chiefly, if "not entirely, spread by personal contact; and to be *kept alive* "*very largely by the unsuspected mild cases* where the throat "or nose affection is so slight as to pass unnoticed."

The *British Medical Journal* (September 10th, 1904) in summarising the above report wrote (referring to pseudo-bacilli): "Their frequent appearance in both stages of throat Diphtheria, "and their constant occurrence amongst contacts with clinical "Diphtheria (especially in schools), leads us to attach serious "importance to them when found in intimate association with "an outbreak of recognised Diphtheria, and to ascribe to them "in such association the rôle common to the mildest form of "Scarlet Fever or of Smallpox—that is, *of keeping alive an* "*infection which, if marked clinical cases alone occurred, might* "*readily be blotted out.*"

There is little doubt that what is true of Scarlet Fever and Diphtheria is also true in the case of Smallpox, and that it is the occurrence of slight unrecognised cases which to a large extent keeps an epidemic alive.

We have, unfortunately, had repeated experience of this in Leicester. I gave numerous instances in my report on the epidemic of 1903, and the same thing happened over and over again during 1904. To give details would only be tedious, but I may mention that to five of these slight overlooked cases occurring in the short space of four weeks no less than 40 other cases were traced.

Nor is this experience in any way peculiar to Leicester. From all parts of the country come reports of outbreaks of Smallpox, often serious, originating or spread by cases so slight that their real nature had at first been overlooked.

The Medical Officer of Health for Battersea in his Annual Report for 1902 (page 77), writing of Smallpox said:—"The "spread of the disease was very largely due to unrecognised or "concealed cases. *This is the usual experience, and constitutes* "*the chief difficulty in dealing with an outbreak of Smallpox.*

"In some cases the disease was of so mild a type that the patient "thought he had merely caught a "heavy cold," and, not troubling "to see a doctor, went about his work after a few days at home "as if nothing had happened."

In a Report made to the Derbyshire County Council by its Public Health Committee in July of last year it was stated:— "The disease (Smallpox), however, is of a very mild type, and a "considerable number of persons are affected without being "sufficiently ill to take to their beds or call in medical advice. "*On this account it is most difficult to stamp out the epidemic.*"

The Medical Officer of Health for Carlisle in his Annual Report for 1903 (page 27), writes:—"A very remarkable and "important feature of the outbreak was the extreme mildness of "many of the cases. In several instances the disease was so "little marked as to escape recognition until a late period of "convalescence when, as a result of an examination of all the "inmates of the infected houses, the cases were detected. *Such "cases were invariably associated with efficient vaccination* in "the person in whom they occurred, thus bearing impressive "evidence of the power of vaccination in mitigating the severity "of Smallpox. The modified character of many of the cases "*increased the difficulty in dealing with the outbreak*, inasmuch "as many of the patients had freely mixed with people for the "greater part of a week before the cases came under observation."

The italics in the above quotations are my own.

My next point is that *the great majority* of these very slight cases, which so easily escape detection and which are the cause of so much trouble and make it so difficult to stamp out Smallpox, occur *in vaccinated persons;* not recently vaccinated, of course—these do not take Smallpox at all—but persons vaccinated many years before, (*e.g.*, young persons or adults vaccinated in infancy) *i.e.*, the class who make up the bulk of the population in a vaccinated community.

It is scarcely necessary to insist on this point for almost every vaccinist recognises the truth of it, but I will just quote from one authority, the late Mr. Ernest Hart.*

* Allbutt's System of Medicine, first edition.

"But it should be borne in mind that in those cases in which "Smallpox occurs after vaccination the disease is, almost without "exception, so far modified that its identity in its earliest stages "is frequently unrecognised. . . . . In Blackburn, the Medical "Officer of Health met with a number of cases of Smallpox in "vaccinated persons where the disease was so far modified that "the patients went about their work without being aware of the "nature of the illness that was upon them."

Smallpox in the unvaccinated, on the other hand is, nearly always a disease presenting well-marked clinical features; the patient is sufficiently ill to necessitate a medical man being called in, and the real nature of the disease can be recognised early in the attack. It is a well-known fact that the vast majority of mistakes in diagnosis occur in the case of vaccinated subjects.

Smallpox is undoubtedly a disease which responds, so to speak, to active preventive measures, such as hospital isolation, etc.; more so probably than any of the other zymotic diseases with which we have to deal in this country; but unless the nature of the disease is recognised these preventive measures are obviously useless, because they cannot be put into operation.

We have, then, to face the fact that vaccination, in spite of the great assistance which *recent* vaccination undoubtedly renders us in fighting Smallpox, may, under certain circumstances, actually conduce to the spread of the disease.

SMALLPOX AND VAGRANCY.

The part played by vagrants in spreading Smallpox has often been insisted upon, and there is little doubt that they played some part in the recent epidemic in Leicester. The number of outbreaks of the disease in common lodging-houses certainly points to this.

The pernicious and unhygienic habits and life of tramps render them specially liable to contract the disease, while (and this is even more important) their nomadic habits and absence of fixed abode make it peculiarly difficult to deal with them

when the disease does occur amongst them. For example, the method of quarantining contacts in their own homes which answers so well in the case of ordinary citizens is almost useless in the case of a lodging-house full of men who are here to-day and perhaps gone to-morrow, leaving no reliable name or address behind.

So important is this question of vagrancy and Smallpox coming to be regarded that a special conference of sanitary authorities, convened by the London County Council, was held in London last summer to consider the subject, and to discuss the best measures for dealing with it.

Many remedies were suggested, including one for the compulsory re-vaccination of the professional tramp.

There is a great deal to be said in favour of such a proposal, and personally I should like to see such a measure put into operation before the much more drastic measure of universal re-vaccination is attempted.

If it can be shown, as I am satisfied that it can, that the vagrant class are exceptionally liable to spread Smallpox, then that is a sufficient reason, on the ground of justice, for treating them differently from the rest of the community. Moreover the principle of making re-vaccination compulsory for certain sections of the community is already recognised, *e.g.*, in some of the public services.

It has been objected that the suggestion is impracticable but personally I believe there would be no insuperable difficulty in securing the re-vaccination of the great majority of those who apply for shelter at the casual wards of our workhouses. A system of certificates could be devised (many tramps already carry pedlars' certificates), and every tramp not provided with a certificate showing that he had already been re-vaccinated could be required to undergo the operation. In the event of temporary disablement caused by such vaccination, a liberal compensation allowance should be granted.

I am aware of course that many of those who are opposed to vaccination on principle would object to this suggestion of re-vaccination of tramps, but they would have much greater

cause for objection if the Re-vaccination Bill now before Parliament, which provides for universal re-vaccination, were to become law!

Personally, I believe that a law of universal re-vaccination, even though providing for a single re-vaccination only, would have a very great effect in diminishing Smallpox, but I am not satisfied, as I have said before, that it is really necessary, and I recognise that it would be a very drastic law, and that there would be some very serious drawbacks, for vaccination is by no means the trivial operation it is sometimes represented to be. Hence, I feel that all other possible means for controlling the disease should be given a fair and thorough trial before universal re-vaccination is resorted to.

THE FATALITY OF SMALLPOX IN PRE-VACCINATION TIMES.

The unexpectedly low fatality of Smallpox in 1892 and 1893, and now again in 1903 and 1904, in a comparatively unvaccinated town like Leicester, raises the question as to the true fatality of the disease before the days of vaccination. This is rather a debated point, and there are insufficient data available to enable a precise conclusion to be arrived at. There is reason to think, however, that the average fatality of Smallpox in pre-vaccination times has, by some, been rather over-estimated. Quite recently a responsible medical writer gave it as 25 per cent., whilst another stated positively that it was 30 to 40 per cent!

There can be little doubt that these terrible proportions were sometimes reached, but there seems no sufficient evidence that the *average* fatality was nearly as high as this, and, indeed, it is scarcely credible that it could have been. Certainly, had such a fatality prevailed in London in the eighteenth century, when the disease was so prevalent that almost everyone suffered from it, the Bills of Mortality must have revealed a higher *mortality* than two to four per thousand population. It seems reasonable to suppose that in some epidemics a very low fatality prevailed, such as the recent one in Leicester (in which, as I have shown, the fatality amongst the unvaccinated was less than two per cent. of the cases), and thus brought down the average. Jurin's

statistics, collected in the eighteenth century, show a fatality of 16·6 per cent., which is probably a fair average.

This point is of considerable importance, because obviously it affects our estimate of what the probable average fatality of Smallpox would be should the disease occur at the present day in an entirely unvaccinated community.

THE "LEICESTER METHOD."

As regards the "Leicester Method," I will say at once that I consider it is too soon yet to arrive at a final conclusion as to its value. Hitherto it has undoubtedly been successful beyond expectation, but it may yet break down and reverse earlier experiences. It must be admitted, however, that the results already achieved seem to indicate, in spite of all that has been said and written to the contrary, that it may be possible, in a civilised community, living under favourable circumstances (as regards congestion of population, etc.) and with a thoroughly efficient sanitary organisation, to effectively control Smallpox even though the general population be unvaccinated.

The question, too, would be greatly simplified if the vagrancy problem were satisfactorily solved.

The experiment, unfortunately, involves risk, but this risk would be minimised if the opposition to and want of faith in vaccination—largely engendered by compulsion—could be overcome, so that in the event of a breakdown of the experiment, universal vaccination could still be resorted to, and a disaster averted; for I firmly believe that any epidemic of Smallpox could be cut short provided the whole population in the affected districts were ready and willing to submit to immediate vaccination.

Leicester's danger, as it seems to me, lies in the fact that the popular feeling against vaccination is so strong that if a breakdown of the present system did occur, it is unlikely that the people would submit to universal vaccination until a very serious catastrophe had occurred.

I believe that the introduction of an amended conscience clause (in which the discretionary magisterial powers, at present so greatly abused, and the cause of so much irritation and friction, were omitted) would do much to allay hostility and opposition,

and bring about a fairer and more rational attitude—on both sides.

I fear there are some who would like to see the conscience clause entirely withdrawn, and stringent and uncompromising compulsion again introduced—who would like to see the vaccination of every infant again rigorously enforced irrespective of the feelings or wishes of its parents—its lawful guardians—under penalty of repeated prosecutions, fines and imprisonment. I can only remind such that this was the course which was once tried in Leicester, when in one year (1881) there were no less than 1154 prosecutions under the Vaccination Acts! The result is now a matter of history, and it is to be feared that it will be many years yet before the mischief wrought by that mistaken policy has been repaired.

COMPENSATION TO "CONTACTS."

Full details of the procedure adopted in dealing with Smallpox cases in Leicester were given in my report on the 1903 epidemic, and it is unnecessary to repeat them here. I will merely refer to the question of granting compensation to "contacts" whom it is thought desirable to keep from attending work.

During the 1903 epidemic the total sum thus expended amounted to £195. During the epidemic of last year the amount was £177.

Further experience has confirmed me in the opinion that this money was well spent.

In the first place it cannot be regarded as desirable that persons who have been exposed to the infection of Smallpox should continue at work in a factory or workshop during the days when the onset of the disease is to be expected. It has been suggested that if "contacts" are visited daily during this critical period it is sufficient. My experience does not endorse this. The early symptoms of Smallpox often resemble those of an ordinary "chill," and, "the wish being father to the thought," "contacts" readily make themselves believe that these symptoms do not indicate anything serious. They are apt, therefore, to

deny the fact that there is anything amiss with them, in the hope that it will soon pass off. Moreover, it may happen that a person who feels quite well when visited by the Inspector sickens before the day is out, and whilst he is still at work. Here again there is a great temptation to wait until the day's work is over.

On the other hand, if a "contact" is not at work, but is out for a walk (and we do not prohibit this), the natural tendency on beginning to feel ill is to go home at once in accordance with the instructions received.

The fact that the Sanitary Authority is paying compensation affords a most useful lever, and commands an obedience to orders which probably could not be equally secured in any other way It tends, moreover, to prevent concealment and deception.

The cost of compensation is not a very serious item in proportion to the total cost of a Smallpox epidemic; and it must be remembered that if "compensation" were not given by the Sanitary Authority many of the families in infected households would have to come upon the rates (through the Guardians) in any case, as it frequently happens that employers decline to have "contacts" back at work.

In Leicester it has been our practice to make a considerable distinction between what we call "inside" and "outside" contacts, *i.e.*, between those who have actually lived in the same house as a person attacked with Smallpox, and those who have only come into chance and transitory contact outside. With the latter each case is treated on its merits, and frequently it is not thought necessary to stop from work.

THE ROYAL COMMISSION ON VACCINATION AND THE "LEICESTER METHOD."

It does not appear to be generally recognised that the finding of the Royal Commission was distinctly favourable to the "Leicester Method." With the twelve years' further experience which has since been obtained it is probable that their report would have been even more favourable.

As the Reports of the Royal Commission are not readily accessible, I venture to quote the following extracts from their Final Report.

"The experience of Leicester affords cogent evidence that "the vigilant and prompt application of isolation, etc., even with "the defects which were brought to light during the recent "epidemic (1892-3), is a most powerful agent in limiting the "spread of Smallpox." (Section 486.)

"We think that a complete system of notification of the "disease, accompanied by an immediate hospital isolation of the "persons attacked, together with careful supervision, or, if "possible, isolation for sixteen days of those who had been in "immediate contact with them, could not but be of very high "value in diminishing the prevalence of Smallpox. . . . . ." (Section 499.)

The following extracts must be read in the light of the experience of Leicester since the R.C.V. Report was written:—

"When we turn to the other branch of the inquiry, how far "such means could be relied on in the place of vaccination, we "find ourselves involved in questions of a much more com- "plicated nature. We have little or no experience to fall back "upon. The experiment has never been tried. The nearest "approach to it has probably been in Australia. But even in "the parts of that country to which we have alluded the "population has not been entirely unvaccinated, though there "has been a large unvaccinated class amongst it. . . . . ." (Section 500).

". . . . Who can possibly say that if the disease once "entered a town, the population of which was entirely or almost "entirely unprotected, it would not spread with a rapidity of "which we have in recent times had no experience, or who can "tell what call might then be made on hospital accommodation "if all those attacked by the disease were to be isolated? "*A priori* reasoning on such a question is of little or no value." (Section 502.)

"We can see nothing, then, to warrant the conclusion that "in this country vaccination might safely be abandoned, and

"replaced by a system of isolation If such a change were made "in our method of dealing with Smallpox, and that which had "been substituted for vaccination proved ineffectual to prevent "the spread of the disease (it is not suggested that it could "diminish its severity in those attacked), it is impossible to 'contemplate the consequences without dismay." (Section 503.)

The next extract marks the approval of the Royal Commission of one of the special features of the "Leicester Method."

"Power should, in our opinion, be conferred on Sanitary "Authorities to give compensation for loss of wages, and "generally for expenses occasioned either by the isolation of "patients, or persons who have come in contact with them, or "such supervision of them as is necessary, whether in hospital or "elsewhere." (Section 506.)

As in some quarters there is a tendency to deny that sanitation has played any part in the reduction of Smallpox mortality, the whole of such reduction being ascribed to the introduction of vaccination, it may be well to quote the Royal Commission on this point also.

"We have already pointed out that on *a priori* ground it is "reasonable to think that improved sanitary conditions would "tend to diminish the fatality of, and so to a corresponding "extent the mortality from, Smallpox. And there can be little "doubt that the period with which we are dealing has been "characterised by an improvement of this description. There "has been better drainage, a supply of pure water, and in other "respects more wholesome conditions have prevailed."

The experience of Leicester certainly confirms this view. Leicester, judging from its low general death-rate, may fairly claim to be a sanitary town, and the fatality of each of the three epidemics which have occurred in the last 30 years has been remarkably low.

Curiously enough the general death-rates for Leicester in the last two years, 1903 and 1904, during which Smallpox has been epidemic, have been the lowest on record, viz., 13·9 and 14·5 per 1000.

DR. PRIESTLEY'S OPINION.

Dr. J. Priestley, Medical Officer of Health for Leicester at the time of the 1892-3 epidemic, and now Medical Officer of Health for Lambeth, in his report on the epidemic of Smallpox in Lambeth in 1901-2, expresses an opinion which may reasonably be taken as applicable to the "Leicester Method." He writes as follows (page 26):—

"What has to be realised to-day, however, is that a Sanitary "Authority must be prepared to fight an epidemic of Smallpox "without too much reliance upon vaccination and re-vaccination. "It is an uphill fight, but that it can be done will be admitted "after a perusal of this report."

"It is unfortunate that it has to be done, as compulsory "vaccination and re-vaccination rapidly stamp out Smallpox, "though the days of compulsion in any shape or form are "rapidly passing away, and the action of the future must be "based on non-compulsion, at least as far as vaccination and re-vaccination are concerned."

Dr. Priestley evidently does not think that the Re-vaccination Bill, now before Parliament, has very much chance of being passed into Law.

A WORD OF WARNING.

It must not be forgotten that a large town like Leicester, possessing a fairly complete sanitary organisation, and prepared to deal very energetically with Smallpox whenever the disease may make its appearance, is in a very different position from many smaller communities possessing little or nothing in the way of sanitary organisation.

It is pitiable to see such communities copying Leicester as regards abandonment of infantile vaccination, but without preparing for any alternative method of controlling the disease, or at least doing so in a quite inadequate manner.

Leicester has succeeded in the past not *because* she has abandoned infantile vaccination, but *in spite* of having done so, and owing, as I believe, to the vigorous manner in which she has grappled with Smallpox in other ways.

It is probable that this fact is not fully appreciated everywhere, and for this reason the example of Leicester may be dangerous. I think it is probable that the sanitary organisation of many parts of the country is still in so primitive a condition that any attempt to adopt the "Leicester Method" to the extent of abandoning universal vaccination would be fraught with great danger.

Lastly, in order to prevent any misunderstanding, let me point out that in Leicester, although the masses of the people disbelieve in vaccination, the responsible officials who have had to fight Smallpox at close quarters have always had unbounded faith in the protective power of vaccination, and have not hesitated to avail themselves of its aid when necessary.

CONCLUSION.

Let me sum up the drift of Part III. of this Report as follows:—

I believe absolutely in the protective power of vaccination, but I think it possible

(*a*) That the importance of universal vaccination has been over-estimated;

(*b*) That the draw-backs and objections to vaccination have been under-estimated;

(*c*) That the terrors of Smallpox (by some and in someways) have been over-estimated;

(*d*) That the efficacy of modern preventive measures has been under-estimated; and

(*e*) That to attempt to force vaccination upon people against their convictions is unnecessary and unwise.

TABLE A.—Age Distribution of Smallpox Cases and Deaths.

CASES.

Age Period.	Under 1 year.	1 to 5	5 to 10	10 to 15	15 to 20	20 to 30	30 to 40	40 to 50	50 to 60	Over 60.	Total.
Vaccinated ...	...	...	...	...	4	34	49	26	9	5	127
Unvaccinated ...	6	23	43	53	41	19	5	1	...	1	192
Uncertain ...	...	...	...	...	1	1	...	...	...	...	2
Total ...	6	23	43	53	46	54	54	27	9	6	321

Table A.—Continued.

DEATHS.

Age Period.	Under 1 year.	1 to 5	5 to 10	10 to 15	15 to 20	20 to 30	30 to 40	40 to 50	50 to 60	Over 60	Total.
Vaccinated ...	...	...	...	...	...	...	...	1	...	...	1
Unvaccinated ...	1	...	2	...	...	...	...	...	...	...	3
Uncertain ...	...	...	...	...	...	...	...	...	...	...	...
Total ...	1	...	2	...	...	...	...	1	...	...	4

TABLE B.

List of Cases Vaccinated (or Re-vaccinated) in the Incubation Period.

Register Number.	Initials of Patients.	Age.	Vaccinal condition before exposure to infection.		Date of Vaccination after exposure.	Date of first appearance of Smallpox Eruption.	Interval between Vaccination and appearance of Smallpox.	Remarks
			Vaccinated.	Unvaccinated.				
43	K.S.	11		x	Feb. 26	Mar. 5	7 days	Very mild case.
45	L.C.	9		x	„ 26	„ 6	8 „	Very mild case. Less than 100 spots.
46	R.K.	26	x		„ 27	„ 7	8 „	Mild case.
79	M.G.	13		x	Mar. 21	„ 28	7 „	Very mild case. Less than 100 spots.
80	E.G.	6		x	„ 21	„ 29	8 „	Very mild case.
93	K.G.	3		x	„ 21	„ 30	9 „	Thick discrete case.
92	J.G.	4		x	„ 21	„ 30	9 „	Trifling case. Only 12 spots.
85	B.B.	6		x	„ 24	„ 30	6 „	Very mild case.
104	H.B.	8		x	„ 24	April 1	8 „	Very mild case. Less than 100 spots.
105	E.B.	1		x	„ 24	„ 1	8 „	Trifling case. 12 spots.

109	F.G.	11 mos.		x	„ 21	„ 31	10 „	Trifling case. 12 spots.
161	E.V.	16		x	„ 4	„ 13	9 „	Coherent.
176	S.J.	9		x	„ 10	„ 19	9 „	Very mild case. Less than 100 spots.
185	S.F.	11		x	„ 19	„ 23	4 „	Coherent.
186	E.L.	11		x	„ 14	„ 24	10 „	Discrete.
199	M.G.	4		x	„ 26	„ 28	2 „	Discrete.
200	A.G.	33	x		„ 26	„ 28	2 „	Trifling case. Less than 50 spots.
214	A.G.	7		x	„ 26	May 7	11 „	Trifling case. Only 6 spots.
248	A.P.	38	x		May 17	„ 23	6 „	Trifling case. Only 5 spots.
280	S.C.	14		x	June 2	June 11	9 „	Discrete.
282	M.C.	4			„ 2	„ 13	11 „	Trifling case. 12 spots.
281	R.C.	39	x		„ 2	„ 13	11 „	Trifling case. 8 spots.
284	F.L.	16		x	„ 6	„ 15	9 „	Trifling case. Less than 100 spots.
286	S.D.	7		x	„ 7	„ 17	10 „	Trifling case. Less than 100 spots.
300	E.G.	5 mos.		x	July 7	„ 18	11 „	Trifling case. Only 25 spots.

TABLE C.

List of Cases in which the Infection is believed to have been Imported.

Date.	Initials of Patients.	Age.	Remarks.
Dec., 1903	J.W.	37	Lodging-house Keeper.
	J.T.	34	Tramp in Lodging-house.
	A.C.	20	Painter. Probably infected near Nottingham.
Jan., 1904	Mrs. R.	35	Tramp. Infected in Loughborough.
	Mr. R.	31	Tramp. Infected in Loughborough.
Feb., „	E.S.	1	Grandchild of Gipsy. Infected in Loughborough.
	J.B.	23	Dealer. Infected in Loughborough.
	Amy K.	20	Tramp. Probably infected in Birmingham.
March „	E.H.	22	Thought to have been infected by Tramp.
May „	Mary C.	5	*Fatal case.* Child of Tramp. Probably infected near Burton-on-Trent.

TABLE D.

Showing number of cases of Smallpox occurring each week during the Epidemic of 1903 (illustrated in Chart I.)

Week ending.	Cases occuring.	Week ending.	Cases occurring.
1902.		June 18	2
Dec. 25	2	„ 25	1
1903.		July 2	3
Jan. 1	0	„ 9	3
„ 8	10	„ 16	0
„ 15	18	„ 23	2
„ 22	22	„ 30	2
„ 29	13	Aug. 6	7
Feb. 5	7	„ 13	2
„ 12	4	„ 20	2
„ 19	5	„ 27	1
„ 26	8	Sept. 3	1
Mar. 5	5	„ 10	1
„ 12	5	„ 17	10
„ 19	10	„ 24	10
„ 26	6	Oct. 1	1
April 2	9	„ 8	1
„ 9	1	„ 15	0
„ 16	6	„ 22	3
„ 23	53	„ 29	2
„ 30	21	Nov. 5	1
May 7	37	„ 12	0
„ 14	46	„ 19	0
„ 21	23	„ 26	0
„ 28	14		
June 4	10		
„ 11	4		394

TABLE E.

Showing number of cases of Smallpox occurring each week during the Epidemic of 1904.

Week ending.	Cases occurring.	Week ending.	Cases occurring.
1903.		April 14	28
Dec. 10	4	„ 21	15
„ 17	0	„ 28	15
„ 24	9	May 5	12
„ 31	1	„ 12	13
1904.		„ 19	21
Jan. 7	1	„ 26	5
„ 14	1	June 2	15
„ 21	3	„ 9	15
„ 28	4	„ 16	5
Feb. 4	8	„ 23	8
„ 11	9	„ 30	0
„ 18	4	July 7	4
„ 25	5	„ 14	0
Mar. 3	7	„ 21	6
„ 10	6	„ 28	0
„ 17	7	Aug. 4	4
„ 24	6	„ 11	1
„ 31	39		321
April 7	33		

TABLE F.

GIVING BRIEF PARTICULARS OF EACH

CASE OF SMALLPOX

OCCURRING DURING THE EPIDEMIC.

TABLE F.—Particulars of each Case of Smallpox occurring during the Epidemic.

No.	Name.	Age.	Sex.	Occupation.	Vaccinal Condition. Vacc.	Vaccinal Condition. Un-vacc.	Type of Disease.	Days in Hosp	Result.	Remarks.
							CASES OCCURRING IN DEC., 1903.			
393	A.W.	36	F	Housewife ...		x	Coherent	46		
394	M.W.	7	F	School		x	Coherent	46		
395	E.W.	12	F	,, ...		x	Confluent, very severe	63		
396	J.H.W.	37	M	Lodg. H. Keeper	x		No eruption	...		Unrecognised case, not removed.
397	W.M.	14	M	School		x	Confluent	46		
398	J.M.	14	M	,, ...		x	Coherent	45		
399	E.R.	11	F	,, ...		x	Confluent	45		
400	E.S.	13	F	,, ...		x	Coherent	45		
401	E.P.	12	M	,, ...		x	Discrete	24		
402	J.T.	34	M	Tramp	x		Confluent	53		
403	F.W.	1½	M	... ...		x	Mild discrete	26		
404	B.W.	14	F	School		x	Discrete	23		
405	E.P.	13	F	,, ...		x	Severe coherent	42		
406	A.C.	20	M	Printer		x	Discrete	35		
							BECINNING OF YEAR 1904.			
1	J.S.	60	M	Workhouse ...	x		Discrete	41		
2	A.C.	22	F	Housewife ...		x	Mild discrete	26		
3	Mrs. R.	35	F	Tramp	x		No eruption	...		Unrecognised case, not removed.
4	J.O.	47	M	Lodg. H. bedmkr	x		Confluent	47		
5	F.M.	27	M	Lodg. H. inmate	x		Very mild discrete ...	17		
6	J.C.	51	M	,, ,,	x		Thick discrete	38		
7	T.R.	31	M	,, ,,	x		Thick discrete	26		
8	J.M.	57	M	,, ,,	x		Very mild discrete .	19		
9	A.E.	27	M	,, ,,	x		Very mild discrete ...	20		
10	A.B.	48	M	,, ,,	x		Mild discrete	25		

11	F.S.	23	M	Lodg. H. inmate		x	Coherent	36		
12	W.W.	64	M	,, ,,	x		Mild discrete	19		
13	D.M.	15	F	Factory		x	Coherent	33		
14	G.R.	49	M	Marine Stores ...	x		Confluent	43		
15	H.K.	41	M	Lodg. H. inmate	x		Discrete...	42		
16	T.B.	64	M	,, ,,	x		,, ...	48		
17	B.G.	30	M	,, ,,	x		Mild discrete	21		
18	E.B.	32	M	Gas works ...		x	,, ,, ...	28		
19	J.T.	50	M	Lodg. H. inmate	x		,, ,, ...	22		
20	J.M.	49	M	,, ,,	x		Confluent	48		
21	E.G.H.	16	M	Publican ...		x	Mild discrete	20		
22	H.C.	49	M	Lodging House	x		Discrete...	23		
23	W.H.L	48	M	Factory... ..	x		Coherent	23		
24	T.S.	43	M	Lodging House	x		Mild discrete	22		
25	A.S.	35	M	,, ,,	x		,, ,, ...	26		
26	B.C.	53	M	,, ,,	x		,, ,, ...	27		
27	E.S.	1	F	... ...		x	Coherent	36		From gipsy caravan.
28	B.J.	23	M	General dealer ..		x	Mild discrete	27		
29	N.B.	67	F	Housewife ...		x	Coherent	45		Severe corneal ulcer
30	J.S.	14	M	School		x	Mild discrete	23		
31	A.E.H.	3	M	... ...		x	Discrete	27		
32	S.B.M.	23	M	Lodging House	?	?	Coherent	44		Vaccination uncertain.
33	H.B.	35	M	,, ,,	x		Mild discrete	29		
34	J.S.	27	M	Potman	x		,, ,, ...	23		
35	W.P.	37	M	Railway labourer	x		,, ,, ...	29		From Casual Ward at Workhouse.
36	A.C.	6	F	School		x	,, ,, ...	50		
37	J.S.	7	M	School		x	Very mild discrete ...	21		
38	A.K.	20	F	Tramp		x	Mild discrete	42		
39	W.B.	38	M	Factory	x		Very mild discrete ...	24		
40	G.P.	40	M	Gardener ...	x		Coherent	31		
41	E.H.	34	F	Housewife ...	x		Very mild discrete ...	17		Said to have had previous Smallpox
42	A.P.	45	M	Street cleanser...	x		,, ,, ,, ...	27		[in childhood.
43	K.S.	11	F	School		x	A few spots	24		Vaccinated during incubation period.

TABLE F.—Continued.

No.	Name.	Age.	Sex.	Occupation.	Vaccinal Condition. Vacc.	Vaccinal Condition. Un-Vacc.	Type of Disease.	Days in Hosp	Result.	Remarks.
44	W.B.	46	M	Lodging house	x		Confluent	10	Died.	See Notes about Vaccination in Text
45	L.C.	9	F	School		x	Less than 100 spots ...	37		Vaccinated in the incubation period.
46	R.K.	26	F	Tramp	x		Mild discrete	25		Re-vaccinated after patent was infected
47	M.B.	27	F	Housewife ...		x	Severe discrete... ...	39		[with Smallpox.
48	W.H.H.	37	M	Factory... ...		x	Severe coherent ...	53		
49	A J.	19	F	Hawker ...		x	Severe discrete... ...	53		Keratitis.
50	J.W.	30	M	Publican ...	x		Very mild discrete ..	20		
51	T.W.	39	M	Factory ...	x		,, ,, ,, ...	19		
52	H.S.	4	M	School		x	Coherent	46		
53	E.B.	15	M	Tailor		x	,, ...			
54	H.B.	12	F	School		x	Discrete	30		
55	J.B.	43	M	Carpenter ...	x		,, ...	33		
56	F.H.	40	M	Ironfounder ...	x		12 spots	19		
57	T.M.	64	M	... ...	x		Coherent	26		Aborted.
58	J.W.G.	15	M	School		x	Very mild discrete ...	26		Epilepsy.
59	G.G.	8	F	,, ...		x	Mild discrete	26		
60	A.B.	6	F	,, ...		x	18 spots	18		
61	W.C.	36	M	Factory... ...		x	Severe confluent ...	38		
62	J.C.	35	M	Picture dealer ...	x		Discrete...	22		
63	H.D.	40	F	Housewife ...	x		Very mild discrete ..	22		
64	W.W.	25	M	Factory... ...	x		Less than 100 spots ...	21		
65	H.P.	17	M	,, ...		x	Confluent			Abscesses.
66	R.S.	15	F	,, ...		x	Coherent	46		Abscess.
67	T.W.B.	33	M	Manufacturer ..	x		Less than 100 spots ...	18		
68	G H.	23	F	Factory... ...		x	Coherent	25		
69	A.N.	22	F	,, ...	x		... ...			Unrecognised case, not removed.
70	R.B.	19	F	,, ...		x	Severe discrete... ...	30		
71	J.C.	20	M	Publican ...		x	Discrete...	24		

72	J.Y.	28	M	... ...	x		Less than 100 spots ...	24		
73	E.Y.	20	F	Housewife ...		x	Mild discrete	45		
74	G.M.	35	M	Drayman ...	x		Less than 100 spots ...	20		
75	E.H.	22	M	Photographer ...		x	Confluent	51	Conjunctivitis.	
76	A.H.	44	M	Fruiterer ...	x		Discrete	26		
77	F.D.	22	F	Domestic ...	x		... ...	33		
78	H.L.	23	M	Factory ...	x		Less than 100 spots ...	23		
79	M.A.G.	13	F	School		x	12 spots	23	Vaccinated during incubation period.	
80	E.G.	6	F	,, ...		x	Very mild discrete ...	33	,, ,, ,, ,,	
81	A.N.	11	F	,, ...		x	Coherent	36		
82	E.J.	25	F	Factory... ...	x		12 spots	18		
83	H.J.	21	F	,, ...	x		,, ...	18		
84	E.S.	25	M	Barber	x		Very mild discrete ...	18		
85	B.B.	4	F	... ...		x	,, ,, ,, ...	35	Vaccinated during incubation period.	
86	G.B.	38	M	Factory... ...	x		... ...		Unrecognised case, not removed.	
87	A.B.	38	F	Housewife ...	x		... ...		,, ,, ,,	
88	W.E.	29	M	Tramways ..	x		30 spots	21		
89	E.H.	52	E	Housekeeper ...	x		... .		Unrecognised case, not removed.	
90	J B.	46	M	Gasworker ...	x		Discrete	24		
91	M.R.	12	F	School		x	,, ...	29		
92	J.G.	4	M	,, ...		x	12 spots	31	Vaccinated duriug incubation period.	
93	K.G.	3	F	... ...		x	Severe discrete ...	35	,, ,, ,, ,,	
94	G.W.G.	40	M	... ...	x		50 spots	30		
95	G.B.	9	M	School		x	Coherent	42		
96	W.N.	35	M	Gasworker ...	x		Discrete	30		
97	G.R.	7	F	School		x	,, ...	31		
98	M.E.	40	F	Laundry ...	x		,, ...	23		
99	H.C.	15	M	Clerk		x	Very mild discrete ...	30		
100	R.L.	24	M	,, ...	x		Less than 100 spots ...	24		
101	M.W.	7	F	School		x	Mild discrete	27		
102	A.C.	7	M	,, ...		x	Coherent			
103	W.S.	18	M	Sewage farm ...		x	Discrete	27		
104	H.B.	8	M	School		x	Less than 100 spots ...	23	Vaccinated in the incubation period.	
105	E.B.	1	F	... ...		x	12 spots	19	,, ,, ,, ,,	

TABLE F.—Continued.

No.	Name.	Age.	Sex.	Occupation.	Vaccinal Condition. Vacc.	Vaccinal Condition. Unvacc.	Type of Disease.	Days in Hosp	Result.	Remarks.
106	G.P.	39	M	Factory... ..	x		Discrete...	33		
107	G.D.	44	M	,, ...	x		Less than 100 spots ...	18		
108	E.M.	12	M	School		x	Severe discrete... ...	39		
109	F.G.	1	F	... ...		x	12 spots	17		Vaccinated in the incubation period.
110	F.K.	33	M	Factory... ..	x		Abortive discrete ...	27		
111	P.H.	21	M	Publican ..		x	Severe discrete... ...	27		
112	H.C.	32	M	Potman... ...	x		... ...			Unrecognised case, not removed.
113	H.C.	9	M	School		x	Coherent	41		
114	F.W.C	2½	M	... ...		x	30 spots...	17		
115	T.C.	1½	M	... ...		x	20 spots...	17		
116	N.C.	19	F	Factory ...	x		Less than 100 spots ...	24		
117	E.C.	11	F	School		x	Discrete	27		
118	E.C.	15	F	Factory ...		x	Severe discrete.	34		
119	D.C.	5/12	F	... ...		x	Discrete	24		
120	B.E.	32	F	Housewife ...	x		12 spots	23		
121	F.E.	8	F	School		x	Discrete	26		
122	H.S.	38	M	Factory... ..	x		43 spots	16		
123	E.B.	10	M	School		x	Very mild discrete ..	28		
124	K.V.	3¾	F	... ...		x	Coherent	51		
125	J.Y.	9/12	M	... ...		x	,, ...	36		
126	E.S.	24	F	Factory ...	x		.. ..			Unrecognised case, not removed.
127	L.S.	18	F	,, ...		x	Discrete...	29		
128	A.S.	10	F	School		x	Coherent			
129	E.S.	52	F	Housewife ...	x		Discrete	43		
130	D.S.	15	F	Factory... ...		x	,, ...	29		
131	T.S.	11	M	School		x	Coherent			
132	W.S.	32	M	Factory... ...	x		Abortive discrete ..	36		
133	S.T.	8	F	School		x	Hœmorrhagic	3	Died.	

134	L.B.	6	F	School		x	Discrete	26		
135	E.G.	5	M	,, ...		x	Confluent	47		
136	G.S.	33	M	Street pavior ...	x		Discrete	36		
137	A.C.	7	F	School		x	Coherent	39		
138	H.W.	38	M	Factory... ..	x		... ...			Unrecognised case, not removed.
139	E.W.	38	F	Housewife ...	x		Mild discrete	21		
140	H.W.	3	M	... ...		x	Discrete	25		
141	M.P.	35	F	Housewife ...	x		Less than 100 spots ...	21		
142	A.B.	36	M	Factory... ...	x		,, ,, ,, ...	22		
143	R.B.	42	M	,, ...	x		Coherent	39		Aborted.
144	E.H.	22	F	,, ...	x		35 spots...	38		Miscarriage.
145	A.J.	6	M	School		x	Discrete...	31		
146	E.E.	10	F	School		x	Coherent	38		
147	W.F.	39	M	Factory... ...	x		Less than 100 spots ...	24		
148	F.M.	26	F	,, ...	x		2 spots	12		Prodromal rash.
149	E.R.	44	F	Boarding house	x		Mild discrete	40		Kerutitis.
150	J.E.S.	27	M	Asbestos worker		x	Coherent	33		
151	E.S.	52	F	Housewife ...	x		Abortive coherent ...	67		Conjunctivitis.
152	A.W.	29	F	Charwoman ...	x		Discrete	27		Miscarriage.
153	W.P.	17	M	Factory... ...		x	,, ...	26		
154	A.C.	18	F	,, ...	?	?	Less than 100 spots ..	25		Vaccination uncertain.
155	L.O.	19	F	... ...		x	Confluent	43		
156	D.F.	10	M	School		x	Severe discrete ...	14		
157	E.F.	12	F	,, ...		x	Mild discrete	28		
158	A.F.	8	M	,, ...		x	,, ,, ...	28		
159	G.G.	17	M	Factory... ...		x	Discrete	42		Conjunctivitis.
160	A.D.	2	F	... ...		x	67 spots...	23		
161	E.V.	16	F	Factory		x	Coherent	31		Vaccinated in incubation period.
162	F.D.	25	F	Housewife ...	x		... ...			Unrecognised case, not removed.
163	T.E.L.	1½	M	... ...		x	Severe discrete ...	33		
164	E.B.	21	F	Factory... ...	x		12 spots	18		
165	T.G.	35	M	Plumber ...	x		Abortive discrete ...	34		
166	H.B.	16	M	... .		x	Discrete	27		

TABLE F.—Continued.

No.	Name.	Age.	Sex.	Occupation.	Vaccinal Condition. Vacc.	Vaccinal Condition. Unvacc	Type of Disease.	Days in Hosp	Result.	Remarks.
167	T.B.	13	M	School		x	Coherent	39		
168	W.B.	11	M	,, ...		x	,, ...	45		
169	E.B.	6	M	,, ...		x	64 spots	27		
170	E.B.	18	F	Factory		x	Mild discrete	26		
171	F.B.	3	M	,, ...		x	43 spots	26		
172	H.W.	10	F	School		x	Discrete	29		
173	Mrs. S.	49	F	Housewife ...	x		Mild discrete	21		
174	J.L.	27	M	Factory... ...	x		Less than 100 spots ...	22		
175	E.M.	35	M	Publican ..	x		Abortive discrete ...	24		
176	S.A.J.	9	F	School		x	Less than 100 spots ..	24		Vaccinated in the incubation period.
177	A.G.	32	M	Factory... ...	x		,, ,, ...	22		
178	E.M.	37	F	Housewife ...	x		Less than 100 spots ...	22		
179	W.B.	65	M	Factory... ...	x		Confluent	57		
180	P.P.	13	M	School		x	,, ...	47		
181	G.K.	16d.	F	,, ...		x	Coherent	29		
182	S.A.P.	27	F	Housewife ...	x		Less than 100 spots ...	25		
183	F.N.	11	M	School		x	Severe discrete... ..	39		
184	W.P.	47	M	Factory... ...	x		Less than 100 spots ..	20		
185	S.F.	10	M	School		x	Coherent	32		Vaccinated during incubation period.
186	E.L.	11	F	,, ...		x	Discrete	31		
187	T.K.	2½	M	... ...		x	Coherent	51		
188	F.W.	19	F	Factory... ...	x		31 spots	19		
189	G.P.	32	F	Monthly nurse...	x		Mild discrete	23		
190	M.S.P.	15	F	... .		x	Coherent	30		[from severe attack 20 years ago.
191	T.P.	38	M	... ...		x	No eruption			Unrecognised case, not remvd, suffered
192	Mrs. D.	26	F	Factory... ...	x		Six spots only			Unrecognised case, not removed.
193	W.G.	34	M	Bootmaker ...	x		Discrete...	22		
194	J.T.L.	36	M	Factory... ...	x		Three spots	22		Prodomal rash.

195	C.C.	13	M	School			x	Coherent	55			
196	J.H.	25	M	Innkeeper ...	x			Less than 100 spots ...	21			
197	W.C.	10	M	School			x	Coherent	28			
198	E.L.	31	F	Factory... ..	x			30 spots...	21			
199	M.G.	4	F	School			x	Discrete	43		Vaccinated in the incubation period.	
200	A.G.	33	F	Housewife ...	x			Less than 50 spots ...	26		Revaccinated after being infected with	
201	G.H.	25	M	Factory... ...	x			Less than 100 spots ...	21		[Smallpox.	
202	J.R.	40	M	,, ...			x	Confluent	43			
203	A.E.C.	3	F	... ...			x	Very mild discrete ...	43			
204	E.L.	16	F	Factory... ...			x	Confluent	49			
205	S.S.	50	M	,, ...	x			About 20 spots... ...			Unrecognised case, not removed.	
206	T.B.	30	M	Barber	x			Less than 100 spots ...	21			
207	A.B.	14	M	School			x	Severe discrete... ...	26			
208	E.P.	20	F	Factory... ...			x	67 spots...	25			
209	J.H.	5 w.	M	... ...			x	Coherent	6	Died.		
210	G.S.	12	M	School			x	Severe Discrete ..	22			
211	E.P.	5	F	,, ...			x	Coherent	28			
212	E.P.	$2\frac{3}{4}$	F	... ...			x	,, ...	49			
213	C.K.	7	M	School			x	Discrete	24			
214	A.G.	7	M	,, ...			x	Six spots	13		Vaccinated in incubation period.	
215	R.B.	8	F	,, ...			x	Mild coherent	54			
216	S.D.	5	M	,, ...			x	Discrete	26			
217	E.F.	10	M	,, ...			x	Coherent	46			
218	W.S.	15	M	Factory... ...			x	Confluent	50			
219	F.S.	7	M	School			x	Coherent	35			
220	M.C.	5	M	,, ...			x	Confluent	18	Died.		
221	A.P.	15	F	Co-op. stores ...			x	Coherent	48			
222	A.C.	32	F	Housewife ...	x			Discrete	30			
223	N.B.	10	F	School			x	Coherent	55			
224	F.S.	14	M	Ironmonger ...			x	,, ...	35			
225	W.S.	9	M	School			x	,, ...	32			
226	E.A.T.	37	F	Housewife ...	x			One spot	14			
227	G.H.T.	7	M	School			x	Discrete	14			

TABLE F.--Continued.

No.	Name.	Age.	Sex.	Occupation.	Vaccinal Condition.		Type of Disease.	Days in Hosp	Result.	Remarks.
					Vacc.	Un-vacc.				
228	J.A.T.	36	M	Factory... ...	x		Discrete	21		
229	J.P.T.	5	M	School		x	Coherent	39		
230	A.J.T.	13	M	,, ...		x	Discrete	28		
231	W.W.T.	10	M	,, ...		x	Coherent	28		
232	A.E.T.	2½	M	... .		x	Severe Discrete ...	46		
233	E.M.T.	15	F	Factory... ...		x	Discrete	25		
234	E.P.	29	M	,, ...	x		20 spots	17		
235	T.T.	43	M	Odd jobs ...	x		Less than 50 spots ...	20		
236	H.K.	12	M	School		x	Coherent	38		
237	A.C.	6	M	,, ...		x	Mild Discrete	37		
238	M.K.	10	F	,, ...		x	Coherent	37		
239	E.W.	14	F	Factory... ...		x	Discrete	37		
240	T.K.	36	M	Coal dealer ...	x		Abortive coherent ...	32		
241	G.K.	5	F	School		x	Discrete	32		
242	H.D.	13	M	,, ...		x	,, ...	36		
243	A.D.	25	F	Housewife ...	x		Two spots	18		
244	E.B.	19	F	... ...	x		,, ,, ...	18		
245	G.S.	24	M	... ...		x	Confluent	53		Boils.
246	J.A.	31	M	Grocer	x		Discrete	19		
247	G.C.	18	F	Factory... ...		x	Coherent	33		
248	A.P.	37	F	Housewife ...	x		Five spots	11		Re-vaccinated during incubation [period.
249	F.N.	18	F	Factory... ...		x	Discrete	28		
250	J.W.	24	M	,, ...	x		Less than 100 spots ..	19		
251	J.T.B.	20	M	,, ...	x		,, ,, ,, ...	19		
252	E.C.	26	F	,, ...	x		,, ,, ,, ...	26		
253	W.T.	23	M	,, ...	x		12 spots	18		
254	J.C.	15	F	,, ...	x		85 spots	21		
255	G.H.	12	M	School		x	Discrete	40		

256	A.M.	25	M	Factory... ...	x		Discrete	19		
257	E.W.	22	F	Housewife ...		x	,, ...	36		
258	E.B.	17	F	Factory... ...		x	Coherent	36		
259	A.J.	7	M	School ...		x	Discrete	32		
260	W.R.	18	M	Factory... ...		x	Confluent	43		
261	E.H.	16	F	,, ...		x	Coherent	31		
262	F.O.	16	F	,, ...		x	Discrete	36		
263	E.C.	2½	F	... ...		x	,, ...	41		
264	E.G.	21	M	Factory... ...		x	,, ...	27	Corneal ulcer.	
265	M.T.	44	F	Housewife ...	x		23 spots	15		
266	E.T.	9	F	School		x	Very mild discrete ..	22		
267	L.N.	15	F	Factory... ...		x	Coherent	47		
268	J.T.	47	M	,, ...	x		Discrete	19		
269	R.N.	17	F	,, ...		x	Coherent	36		
270	M W.	16	F	,, ...		x	Discrete	25		
271	J.L.	14	F	,, ...		x	Confluent	49		
272	T.W.L	10	M	School		x	20 spots	34		
273	J.D.	8	F	,, ...		x	Very mild discrete ...	22		
274	E.W.	17	F	Factory... ...		x	Coherent	44		
275	H.W.	10	M	School		x	,, ...	34	Conjunctivitis.	
276	T.W.	15	M	Factory... ...		x	,, ...	48		
277	A.W.	3	M	... ...		x	Very mild discrete ...	23		
278	E.W.	35	F	Housewife ...	x		... ...		Unrecognised case, not removed.	
279	A.H.R.	42	M	Factory... ...	x		Less than 100 spots ...	20		
280	S.C.	14	F	,, ...		x	Discrete...	40	Vaccinated in the incubation period.	
281	R.C.	39	F	Housewife ...	x		8 spots	19	,, ,, ,, ,,	
282	M.C.	4	F	School		x	12 spots...	19	,, ,, ,, ,,	
283	E.W.	15	F	Factory... ...		x	Discrete...	40		
284	F.L.	15	M	Tramways ...		x	Less than 100 spots ...	24	Vaccinated in the incubation period.	
285	J.S.	7	M	School		x	Discrete...	40		
286	S.D.	7	M	,, ...		x	55 spots...	26	Vaccinated in the incubation period.	
287	J.L.	12	M	,, ...		x	Discrete	39		
288	P.M.	10	M	,, ...		x	Coherent	39		

TABLE F.—Continued.

No.	Name.	Age.	Sex.	Occupation.	Vaccinal Condition. Vacc.	Vaccinal Condition. Unvacc.	Type of Disease.	Days in Hosp	Result.	Remarks.
289	E.H.	16	F	Factory... ..		x	Discrete	24		
290	A.T.	7	M	School		x	,, ...	38		
291	M.L.	23	F	Housewife ...		x	Coherent	26		
292	N.D.	21	F	Factory... ...		x	,, ...	31		
293	F.L.	12	M	School		x	97 spots...	25		
294	L.G.	30	F	,, ...	x		confluent	31		
295	J.W.	6	M	,, ...		x	Severe discrete... .	30		
296	R.W.	12	M	,, ...		x	,, ,, ...	30		
297	S.M.	10	M	,, ...		x	Coherent	37		Hæmaturia
298	N.G.	10	F	,, ...		x	,, ...	30		
299	C.G.	14	F	Factory... ...		x	Discrete...	22		
300	E.G.	4 m.	F	... ...		x	25 spots...	19		Vaccinated in the incubation period
301	G.B.	4	M	... ...		x	Very mild discrete ...	24		
302	H.B.	20	M	Carpenter ...		x	Coherent	28		
303	F B.	15	M	Clerk		x	Severe discrete... ...	33		Conjunctivitis
304	C.B.	48	M	Factory... ..	x		Mild discrete	24		
305	E.B.	18	F	,, ...		x	Severe discrete... ...	32		Conjunctivitis
306	C.B.	17	M	,, ...		x	... ...			Unrecognised case, not removed
307	K.B.	31	F	... ...	x		Abortive discrete ...	21		Doubtful case